Transportation Electrification

September 2, 2015

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Together...Shaping the Future of Electricity
### Automakers Investing $ Billions In New PEVs
#### 15+ Models Arriving and On The Way

<table>
<thead>
<tr>
<th>Make</th>
<th>Model</th>
<th>Type</th>
<th>Body Style</th>
<th>Launch</th>
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<tbody>
<tr>
<td>Cadillac</td>
<td>ELR</td>
<td>PHEV</td>
<td>Luxury couple</td>
<td>Q4 2013</td>
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<tr>
<td>Porsche</td>
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<td>Luxury sedan</td>
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<td>BMW</td>
<td>i3</td>
<td>BEV; REx</td>
<td>5 door hatchback</td>
<td>Q2 2014</td>
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<tr>
<td>KIA</td>
<td>Soul</td>
<td>BEV</td>
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<td>Q3 2014</td>
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<tr>
<td>Mercedes</td>
<td>B-Class</td>
<td>BEV</td>
<td>5 door hatchback</td>
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<tr>
<td>BMW</td>
<td>i8</td>
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<td>Sports car</td>
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<tr>
<td>VW</td>
<td>eGolf</td>
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<td>Tesla</td>
<td>Model X</td>
<td>BEV</td>
<td>SUV/Crossover</td>
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<td>Outlander</td>
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<td>SUV/Crossover</td>
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<td>X5</td>
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<td>Chrysler</td>
<td>Town &amp; Country</td>
<td>PHEV</td>
<td>Minivan</td>
<td>2016</td>
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<td>Volvo</td>
<td>V60</td>
<td>PHEV</td>
<td>Wagon</td>
<td>2016</td>
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</tbody>
</table>
Almost Anything Can Be Electrified – To Some Degree

Industrial ‘Non-Road’ Transportation Electrification Results in Greatest Air Quality Improvements
Plug-In Electric Vehicle Charging Technology

120V – Level 1 (1.4kW)
Portable cordset
Use any 120V outlet
~ 6 km per hour of charging

240V – Level 2 (3.3 – 19.2 kW)
Permanent charge station (EVSE)
15 – 90 km per hour of charging

DC Fast Charging
50 kW and greater
Fast, expensive
3 – 8 km per minute of charging
Where to Locate Infrastructure?

- **Residential**
  - Single-family homes relatively simple
  - Multi-unit and tenant dwellings
  - Use of existing outlets at very low cost

- **Workplace**
  - Potential has grown—seen as driver of adoption
  - High installation costs, scaling issues

- **Public Charging**
  - Clustering – need to build out networks
  - Long-term sustainability of infrastructure
  - Can be difficult to find suitable host sites
Where Do Vehicles Spend Their Time When Driven?

Vehicles spend large amounts of time both parked and just sitting at home and work.
A Few Points about PEV Infrastructure

- It's expensive and must be carefully planned.
- Paradigm shift – weekly refueling versus daily recharging.
- There are few, if any, proven experts at planning EV infrastructure—no one has the magic formula.
- No one knows your community better than you do:
  - All of the needed PEV readiness expertise is available from your local stakeholders.
- It is likely necessary to leverage all the possible infrastructure investment, incentive, and ownership models (public, private, utility, etc).
It is Important to Plan Infrastructure Deployment
Local & Regional Requirements
Points to Consider

- Stakeholder working groups are critical – inclusive and with strong leadership
- Recommend an economic benefits study
- Develop comprehensive infrastructure and deployment plans
- Long-term goal is 2050 – but go for early victories.
- Most EV deployment in three categories
  1. Economics work today—go and deploy!
  2. Economics not quite there—consider additional benefits or incentives. Consider limited pilots.
  3. More development or R&D needed
Thank you

Transportation Electrification in U.S. – 2030 reductions in ground level ozone